REMARKS

Applicants appreciate the thorough examination of the present application that is reflected in the Official Action of February 21, 2007. In response, the claims have been amended to further clarify the patentable distinctions over U.S. Patent Application Publication US 2003/0083716 to Nicolelis et al., taken alone or in combination with the secondary references. Applicants respectfully submit that all the claims are now in condition for allowance, for at least the reasons that will now be described.

The Independent Claims Are Patentable Over Nicolelis et al.

Independent Claims 1, 19 and 30 are structural, method and functional analogs of one another. Accordingly, for the sake of brevity, only Claim 1 will be analyzed.

Independent Claim 1 has been amended to specifically recite that the neural event waveform processor is configured to extract single neuron action potentials, i.e., a wave of electrical discharge by a single neuron lasting on the order of milliseconds. Moreover, Claim 1 has been amended to specifically recite that the neural event waveform processor is configured to extract single neuron action potentials with waveforms that exceed 500 Hz, i.e., the frequency components of a single neuron action potential exceed 500 Hz. Support for these amendments may be found, for example, at Page 6, line 33-Page 7, line 4 and at Page 8, lines 3-7 and 18-21 of the present application.

In sharp contrast, Nicolelis et al. relates to an *"Intelligent Brain Pacemaker for Real-Time Monitoring and Controlling of Epileptic Seizures"*, as noted by the Nicolelis et al. title. This proposed intelligent brain pacemaker includes one or more electrodes that is adapted to acquire field potential measurements indicative of a mammal's brain activity in real-time, as noted, for example, in Paragraph [0008] of Nicolelis et al. As noted in Paragraph [0034] of Nicolelis et al., the term "field potential" means voltage measurements collected from one or more locations in a subject's brain or nervous system. As also noted in Paragraph [0008] of Nicolelis et al., the intelligent brain pacemaker includes a seizure detector adapted to detect seizure-related brain activity of a mammal in real-time. For example, as noted in Paragraph [0035] of Nicolelis et al.:

> As used herein, the term "known pattern of epileptic brain activity" means a pattern of brain activity known to be associated with an epileptic condition. The term can refer to brain activity occurring before or during a seizure that is recognized as activity associated with an epileptic

> condition. The term specifically encompasses field potential values that exceed a predetermined threshold value....

Accordingly, Nicolelis et al. does not describe or suggest the extraction of single neuron action potentials, nor would it be obvious to extract single neuron action potentials from Nicolelis et al., because single neuron action potentials would not appear to be relevant to the detection of an epileptic seizure. For at least these reasons, Claim 1 is not anticipated nor obvious in view of Nicolelis et al.

Moreover, consistent with Nicolelis et al.'s objective to provide an *"Intelligent Brain Pacemaker for Real-Time Monitoring and Controlling of Epileptic Seizures"*, Nicolelis et al. specifically filters out waveforms that are not related to epileptic seizures. In particular, as described, for example at Paragraph [0173] of Nicolelis et al.:

> In an example of a type of data analysis that can be performed, field potential traces can first be band-pass filtered at 5-30 Hz. A sliding window (e.g., a 1 sec window with a 0.5 sec overlap) can then be used to quantify the activity of the absolute values of the field potential traces. (Emphasis added.)

In sharp contrast, amended Claim 1 recites that the neural event waveform processor is configured to extract single neuron action potentials with waveforms that exceed 500 Hz. The claimed extracted frequency components are more than an order of magnitude greater than the frequencies being considered by Nicolelis et al. for monitoring and controlling epileptic seizures. Accordingly, amended Claim 1 is not anticipated by Nicolelis et al. for at least these additional reasons. It also would not be obvious to extract signals with waveforms that are more than an order of magnitude greater than described in Nicolelis et al. Accordingly, Claim 1 is also unobvious over Nicolelis et al. for at least these additional reasons.

Many of the Dependent Claims Are Separately Patentable

The dependent claims have been amended for consistency with the amended independent claims and new Claims 31-36 have been added. The withdrawn claims have also been amended for consistency with the amended claims, so that they are consistent with the amended claims when they are rejoined upon allowance of a generic claim.

The dependent claims are patentable at least per the patentability of the independent claims from which they depend. Moreover, many of the dependent claims provide separate bases for patentability, as will now be discussed.

For example, Claim 5 recites that the neural event waveform processor is further configured to identify a neuron that is responsible for the single neuron action potential at frequencies that exceed 500 Hz. In rejecting Claim 5, the Examiner cites Paragraphs [0052] and [0053] of Nicolelis et al. However, these paragraphs do not provide any description or suggestion of identifying an individual neuron, nor would there appear to be any need to identify an individual neuron in order to provide an *"Intelligent Brain Pacemaker for Real-Time Monitoring and Controlling of Epileptic Seizures"*. Accordingly, Claim 5 is independently patentable.

Claims 8 and 9 have been amended to recite that the neural stimulation waveforms are provided to the neural event electrode interface so as to provide the neural stimulation waveforms to the electrodes. Thus, in Claims 8 and 9, the same electrodes are used to capture the electrical signals that are associated with at least one neuron and to stimulate the neuron itself in a bidirectional manner. In sharp contrast, in Nicolelis et al., different sets of electrodes **22** and **20** are used to capture the electrical signals and provide stimulation, respectively. The use of different electrodes is consistent with Nicolelis et al.'s desire to provide an *"Intelligent Brain Pacemaker for Real-Time Monitoring and Controlling of Epileptic Seizures"*, and it would not be obvious from Nicolelis et al. to use the same electrodes for capturing signals and for stimulation. Accordingly, Claims 8 and 9 are independently patentable.

Claim 14 is also independently patentable because Claim 14 recites that the electrical signals that are associated with the at least one neuron are generated by an *in vitro* sample. Clearly *in vitro* use would not apply to an *"Intelligent Brain Pacemaker for Real-Time Monitoring and Controlling of Epileptic Seizures"*. Nor would it be obvious to modify Nicolelis et al.'s *"Intelligent Brain Pacemaker for Real-Time Monitoring and Controlling of Epileptic Seizures"* to provide *in vitro* use, notwithstanding known analysis of signals from *in vitro* samples as exemplified, for example, by U.S. Patent 6,665,562 to Gluckman et al. Accordingly, Claim 14 is independently patentable. Similar analysis applies to method Claim 26.

Claim 17 is also independently patentable, because Claim 17 recites further processing of the single neuron action potentials with waveforms that exceed 500 Hz at a base station. Further processing at a base station does not appear to be described or suggested in Nicolelis et al. and, indeed, further processing would not appear to be needed in order to provide an *"Intelligent Brain Pacemaker for Real-Time Monitoring and Controlling of Epileptic Seizures"*. Accordingly, Claim 17 is independently patentable.

Claim 18 also is independently patentable. In particular, Claim 18 recites:

> 18. A system according to Claim 17 further comprising a plurality of neural event waveform processors and wireless transmitters, and wherein the base station is configured to wirelessly receive the neural events that are transmitted by a plurality of the wireless transmitters and to further process the neural events that are wirelessly received.

As noted in the present application, for example at Page 6, lines 13-17:

> Some embodiments of the invention may also arise from recognition that in some conventional systems, multiple subjects may not easily and naturally interact and be recorded in the same closed environment. It may be desirable for subjects to interact with one another while being monitored so that the data reflects neurological activity in a realistic environment.

A central base station that can process events from multiple subjects is not described or suggested by Nicolelis et al., nor would such a central base station appear to be consistent with Nicolelis et al.'s desire to provide an *"Intelligent Brain Pacemaker for Real-Time Monitoring and Controlling of Epileptic Seizures"*. Accordingly, Claim 18 is independently patentable.

New Claims 31 and 34 recite that the waveforms (frequency components) exceed 1000 Hz, and new Claims 32 and 35 recite that the waveforms exceed 1000 Hz and are less than 10,000 Hz. These waveforms are certainly not described or suggested in Nicolelis et al., and specifically appear to be filtered out in Nicolelis et al. Accordingly, these claims are also independently patentable.

Finally, new Claims 33 and 36 recite that a plurality of single neuron action potentials are extracted and processed for a plurality of neurons with waveforms that exceed 500 Hz. As noted in the present application, for example at Page 10, lines 29-32:

> The device may allow segregation of signals from individual neurons as specific locations within the culture chamber that correspond to identified synaptic cellular events. Cultured neural networks may also be recordable with a WINE device.

Again, the extraction of multiple single neuron action potentials for multiple neurons is not described or suggested by Nicolelis et al., nor would such multiple single neuron action potentials appear to be consistent with Nicolelis et al.'s desire to provide an *"Intelligent Brain*

Pacemaker for Real-Time Monitoring and Controlling of Epileptic Seizures". Accordingly, these claims are also independently patentable.

Conclusion

Applicants again appreciate the thorough examination and the new citation of Nicolelis et al. In response, the independent claims have been amended considerably to further clarify the patentable distinctions over Nicolelis et al. Moreover, many of the dependent claims are independently patentable. Accordingly, Applicants respectfully request allowance of the independent claims, rejoinder of the withdrawn claims, and allowance of the present application.

If, in the opinion of the Examiner, a telephonic conference would expedite the examination of this matter, the Examiner is invited to call the undersigned attorney at (919) 854-1400.

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